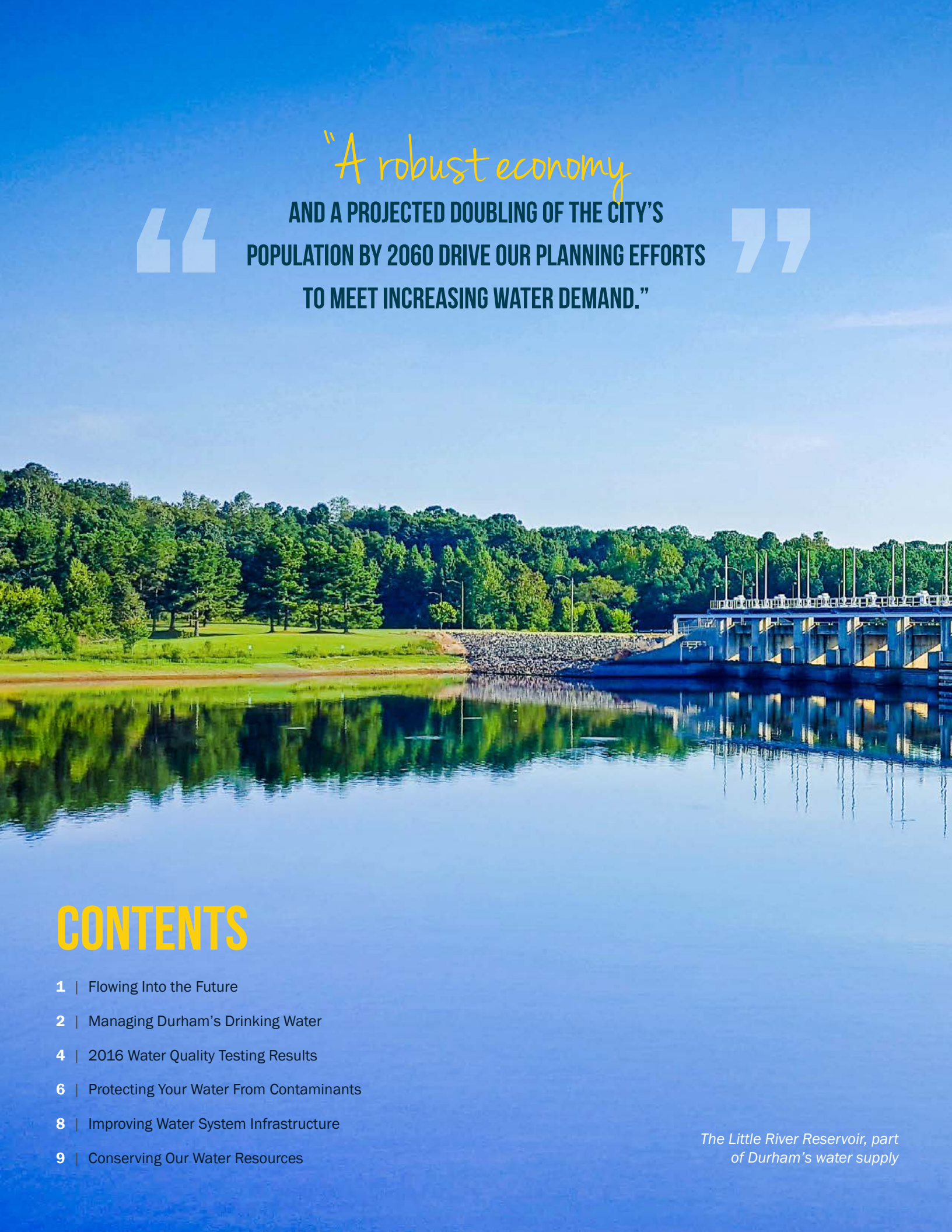


Flowing Into **THE FUTURE**



2016 WATER QUALITY REPORT

CITY OF DURHAM DEPARTMENT OF WATER MANAGEMENT



"A robust economy
**AND A PROJECTED DOUBLING OF THE CITY'S
POPULATION BY 2060 DRIVE OUR PLANNING EFFORTS
TO MEET INCREASING WATER DEMAND."**

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*The Little River Reservoir, part
of Durham's water supply*

Flowing Into THE FUTURE

Reliability. Sustainability. Resiliency.

These three words drive the City of Durham's Department of Water Management as we work to ensure we can provide you with clean, safe, abundant drinking water for decades to come.

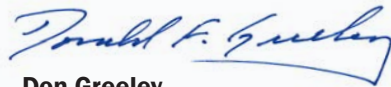
A robust economy and a projected doubling of the City's population by 2060 drive our planning efforts to meet increasing water demand.

In 2016, we took major steps toward meeting future demand by launching a major capital project to increase capacity at our water treatments plants. We also collaborated with our neighboring water systems to secure additional backup water supplies for our system.

Among the results you'll read about in this report, we:

- **Delivered 27.5 million gallons of water a day to residential and commercial customers.** We monitor and analyze your water every day to ensure it meets or surpasses all federal and state standards for purity.
- **Achieved ZERO drinking water quality violations for the calendar year.**
- **Successfully completed our triennial lead and copper testing.**
- **Broke ground on a \$100 million water treatment plant upgrade project at the Brown and Williams water treatment plants.** This project will increase the Brown plant's capacity from 30 million to 42 million gallons per day (MGD). Both plants will receive extensive enhancements in technology, data collection systems, and facilities.
- **Strengthened long-standing partnerships with interconnected utilities across the Triangle.** Partnerships enable our network of water systems to provide backup services and capacity for each other during planned and unplanned events.
- **Continued progress on expanding our allocation of water from Jordan Lake.** We received approval in early 2017.
- **Received national recognition for excellence in promoting WaterSense-labeled products.** It is one of many public information and conservation initiatives that promote water efficient behaviors among our residents.

Explore this report and learn more about the many ways we are investing in a reliable, sustainable, and resilient water system that promote water-efficient behaviors among our customers.



Don Greeley

Director, Department of Water Management



CITY OF DURHAM DEPARTMENT OF WATER MANAGEMENT

The Department of Water Management, guided by the City's and Department's strategic plans, provides Durham residents and businesses with cost-effective water and wastewater services that meet customers' expectations and all regulatory requirements.

Learn more at durhamnc.gov/944

MANAGING DURHAM'S DRINKING WATER

Where It Comes From. How It's Treated.

Drinking water – both tap and bottled – comes from rivers, lakes, streams, ponds, reservoirs, springs, and wells.

As this water travels over land or through the ground, minerals and other materials naturally dissolve into it. As it moves through our environment, water can also pick up substances that are the result of animal or human activity.

Source water may contain:

- Microbial contaminants, such as viruses and bacteria.
- Inorganic contaminants, such as salts and metals.
- Pesticides and herbicides from agriculture or urban run-off.
- Organic chemicals from industrial processes or run-off.
- Radioactive contaminants that can occur naturally.

The EPA regulates the amount of certain substances in your tap water. This is to ensure that tap water is safe to drink. The U.S. Food and Drug Administration establishes limits for contaminants in bottled water to protect public health.

FOUR SOURCES ENSURE ABUNDANT DRINKING WATER

Durham residents and businesses use, on average, nearly 27.5 million gallons of water a day (MGD). We're fortunate to have two high-quality surface water sources to meet that demand: Lake Michie, built in 1926, and Little River Reservoir, built in 1988.

DURHAM DRINKING WATER SOURCES

Lake Michie
Little River Reservoir
Jordan Lake
Teer Quarry

City water managers use modeling to determine the amount of water that can be taken from the two lakes. Accounting for the extreme drought conditions of 2007-2008 and a 20 percent safety factor, these two sources safely yield 27.9 MGD. Plans are progressing to tap

Below: Teer Quarry provides emergency supplemental water for the City.

THIRSTY? DRINK DURHAM TAP WATER INSTEAD OF BOTTLED

City tap water:

- Meets all federal and state quality standards
- Reduces environmental impact (no discarded plastic bottles)
- Saves you money

"...There is no assurance that bottled water is cleaner or safer than tap. In fact, an estimated 25 percent or more of bottled water is really just tap water in a bottle – sometimes further treated, sometimes not."

"The Truth About Tap"
National Resources
Defense Council
January 5, 2016

DrinkTap.org





Above: The City performs laboratory analyses every four hours, 365 days a year, to ensure water quality.

facilities that will allow the quarry to refill from a number of sources during normal conditions and provide a reliable emergency water source.

TWO TREATMENT PLANTS PROVIDE CLEAN, SAFE DRINKING WATER

Water moves from Durham's two supply lakes to its two City treatment plants – Williams and Brown – by gravity flow, hydropower, and electric power. On-site reservoirs at each plant hold a two- to three-day supply of water that helps even out the pumping strategy.

In 2016, Durham's two plants provided 27.5 MGD of water to approximately 270,000 people in the City's service area.

Williams Water Treatment Plant on Hillandale Road, completed in 1917, has been upgraded a number of times and has a capacity of 22 MGD. Brown Water Treatment Plant on Infinity Road, completed in 1977, has a capacity of 30 MGD. Major renovations are underway at both plants ([learn more on page 8](#)).

Both plants use conventional water treatment processes. The initial treatment step is coagulation, which involves the rapid mixing of caustic and ferric sulfate into the untreated source water. Next, the water flows into chambers, where gentle mixing allows dirt and other impurities to stick together, or flocculate. Heavy floc particles are formed, settle, and are removed in sedimentation basins. Chlorine is added to the settled water as a disinfectant. The water then flows through sand and anthracite filters to remove any remaining particles. Phosphate (which keeps pipes from corroding) and fluoride (for dental health) are then added. In the final step, chloramines are added as a disinfectant.

The City of Durham has added fluoride to its drinking water since 1957 to promote dental health. Until recently, state regulations required a target concentration of 1.0 mg/L for fluoride. However, in 2011, the EPA and Centers for Disease Control determined that dental health could be maintained with lower levels of fluoride. Based on this, N.C. regulators have allowed water systems to decrease their fluoride target levels to 0.7 mg/L. The City changed dosage levels for fluoride immediately upon receiving approval. Testimony from public health experts supports the continued addition of fluoride to drinking water as an ongoing safeguard for dental health.

two additional water sources – Jordan Lake and Teer Quarry – to meet demand now and in the future.

Jordan Lake has provided as-needed water for the City via the Town of Cary's water system since 2002, when we obtained an allocation of approximately 10 MGD. Following the drought of 2007-2008, the City pursued an additional 6.5 MGD allocation to meet projected water demand through 2060. The N.C. Environmental Management Commission granted the request in early 2017. The City is collaborating with neighboring water agencies to bring water directly from Jordan Lake into our system.

Teer Quarry first provided emergency supplemental water for the City during the height of the drought in 2007-2008. The City purchased the abandoned quarry in 2004 and is planning to build permanent

2016 WATER QUALITY TESTING RESULTS

CONTAMINANTS TESTING: 100% COMPLIANCE

The City (Public Water System ID # 03-32-010) routinely monitors more than 150 contaminants in your drinking water, in accordance with federal and state laws. The table below lists all the regulated drinking water contaminants that were detected during testing conducted from Jan. 1-Dec. 31, 2016. It shows that all substances were found to be within acceptable levels during 2016. Note: EPA and the state require water providers to monitor for certain contaminants less than once per year because the concentrations of those contaminants are not expected to vary significantly from year to year. Thus, some of the data, while representative of water quality, is more than one year old.

Substance and Unit of Measurement	Level Detected and Range	Violation Yes/No	Max. Level Allowed (MCL)	Ideal Goal (MCLG)	Potential Source(s) of Substance
Monitored at the Treatment Plants					
Chloramines mg/L (as Cl ²)	2.0 average	NO	MRDL 4.0	MRDLG 4.0	Water additive to control microbes
Chlorine mg/L	2.1 average	NO	MRDL 4.0	MRDLG 4.0	Disinfectant to control microbes
Fluoride mg/L	0.76 maximum (0.58–0.76)	NO	4.0	4.0	Naturally occurring mineral; added to promote dental health
Nitrate mg/L (as Nitrogen)	0.27 average (0.10–0.49)	NO	10.0	10.0	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits
Turbidity NTU	0.08 maximum (0.07–0.08)	NO	TT	N/A	Soil runoff
Turbidity, % of monthly samples ≤ 0.3 NTU	100%	NO	95%	N/A	Soil runoff
Total Organic Carbon, mg/L (TOC) Results show the range of TOC in both source and treated water. Durham's processes remove more than the required 50%.	Average removal 69% Source 7.12 (4.17–10.79) Treated 2.23 (1.63–3.07)	NO	NR	TT 50% removal	Naturally present in the environment
Alpha emitters, pCi/L Samples collected and analyzed 2008. Next sample event 2017.	None detected (no range)	NO	15	0	Erosion of natural deposits
Beta/photon emitters, pCi/L Samples collected and analyzed 2008. Next sample event 2017.	None detected (no range)	NO	50	0	Decay of natural and man-made deposits
Monitored at the Customer's Tap					
Copper, mg/L EPA-required triennial sampling conducted July-September 2016	< 0.05 (90th percentile)	NO	AL=1.3	1.3	Corrosion of household plumbing systems
Lead, mg/L EPA-required triennial sampling conducted July-September 2016	<0.003 (90th percentile)	NO	AL=0.015	0	Corrosion of household plumbing systems
Monitored in the Distribution System					
Total Coliform Bacteria (presence or absence)	0%	NO	5% of monthly samples are positive	0% positive	Naturally present in the environment
Fecal Coliform or <i>E. coli</i> (presence or absence)	0	NO	0	Note: The MCL is exceeded if a routine sample and repeat sample are total coliform positive, and one is also fecal coliform or <i>E. coli</i> positive	Human and animal fecal waste

DISINFECTION BYPRODUCTS TESTING: 100% COMPLIANCE

Durham samples and tests drinking water from selected, state-approved locations across the city every quarter to ensure disinfection byproducts remain within acceptable levels. This table shows that all byproducts were found to be within acceptable levels during 2016.

Stage 2 Disinfection Byproduct Compliance — Based on Locational Running Annual Average (LRAA)			
Five Haloacetic Acids Byproduct of drinking water disinfection MCL – 60 µg/L MCLG – 0 µg/L	Average Level Detected and Range (µg/L)	Total Trihalomethanes Byproduct of drinking water disinfection MCL – 80 µg/L MCLG – 0 µg/L	Average Level Detected and Range (µg/L)
EP1	26 (22-28)	EP1	45 (24-66)
EP2	27 (23-32)	EP2	41 (24-57)
B01	27 (23-28)	B01	47 (26-67)
B02	29 (26-32)	B02	46 (29-68)
B03	30 (26-36)	B03	47 (28-68)
B04	29 (27-32)	B04	43 (26-62)
B05	32 (26-43)	B05	47 (27-67)
B06	32 (25-44)	B06	48 (27-66)
B07	29 (26-32)	B07	46 (27-65)
B08	30 (25-41)	B08	40 (25-60)
B09	29 (27-30)	B09	46 (26-69)
B10	29 (28-30)	B10	46 (29-62)
B11	31 (25-41)	B11	40 (26-58)
B12	26 (23-29)	B12	45 (27-65)

Analyses of Interest

Parameter and Unit of Measurement	Annual Average
pH, standard units (range)	7.4–7.6
Alkalinity, mg/L	22
Calcium, mg/L	5.1
Chloride, mg/L	9.8
Conductivity, micromhos/cm	225
Hardness - Calculated, mg/L	22
Hardness - EDTA, mg/L	22
Orthophosphate, mg/L (as PO ⁴)	1.12
Potassium, mg/L	1.86
Sodium, mg/L	30.8
Sulfate, mg/L	56.2
Total Solids, mg/L	124
Zinc, mg/L	0.36

KEY TO ABBREVIATIONS AND TERMS

< less than

µg/L micrograms per liter, or parts per billion

AL Action Level, concentration of a contaminant, which, if exceeded, triggers treatment or other requirements that a water system must follow. Action Levels are reported at the 90th percentile for homes at greatest risk.

LRAA Locational Running Annual Average, average of sample analytical results for samples taken at a particular monitoring location during the previous four calendar quarters under the Stage 2 Disinfection Byproducts Rule

MCL Maximum Contaminant Level, highest level of a contaminant that

is allowed in drinking water. NOTE:

MCLs are set at very stringent levels.

To understand the possible health effects described for many regulated constituents, a person would have to drink two liters of water every day for a lifetime at the MCL level to have a one-in-a-million chance of experiencing the described health effect.

MCLG Maximum Contaminant Level Goal, level of a contaminant in drinking water below which there is no known or expected risk to health

mg/L milligrams per liter, or parts per million

MRDL Maximum Residual Disinfectant Level, highest level of a disinfectant allowed in drinking water

MRDLG Maximum Residual Disinfectant Level Goal, level of a drinking water disinfectant below which there is no known or expected risk to health

N/A not applicable

ND not detected

NR not regulated

NTU Nephelometric Turbidity Units, measure of the clarity or cloudiness in water

pCi/L picocuries per liter, measure of the radioactivity in water

TT Treatment Technique, required process intended to reduce the level of a contaminant in drinking water



PROTECTING YOUR WATER FROM CONTAMINANTS

WHAT EPA WANTS YOU TO KNOW ABOUT WATER AND CONTAMINANTS

Drinking water, including bottled water, can be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily mean that the water could be a health risk. Get more information about contaminants and potential health effects by calling the EPA's Safe Drinking Water Hotline at (800) 426-4791.

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised people, such as those with cancer undergoing chemotherapy, people who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly people, and infants, can be particularly at risk for infections. These

people should seek advice about drinking water from their health care providers. EPA/CDC guidelines on the best ways to reduce the risk of infection by ***Cryptosporidium*** and other microbial organisms are available from the Safe Drinking Water Hotline at (800) 426-4791.

NO CRYPTO HERE

Cryptosporidium (Crypto), a microbial parasite that comes from animal waste, occurs naturally in rivers and lakes but can cause fever, diarrhea, and other gastrointestinal symptoms when swallowed.

Controlling and minimizing development and animal activities in our watershed reduces the occurrence of *Crypto* in source water. The water treatment process of filtration, sedimentation, and disinfection typically removes it.

The City began monthly testing for *Crypto* in fall 2006 (as per Long Term Two Enhanced Surface Water Treatment Rule, LT2SWTR) and **has never found the parasite in any monitoring event.**

WHAT THE CITY WANTS YOU TO KNOW ABOUT LEAD AND DRINKING WATER

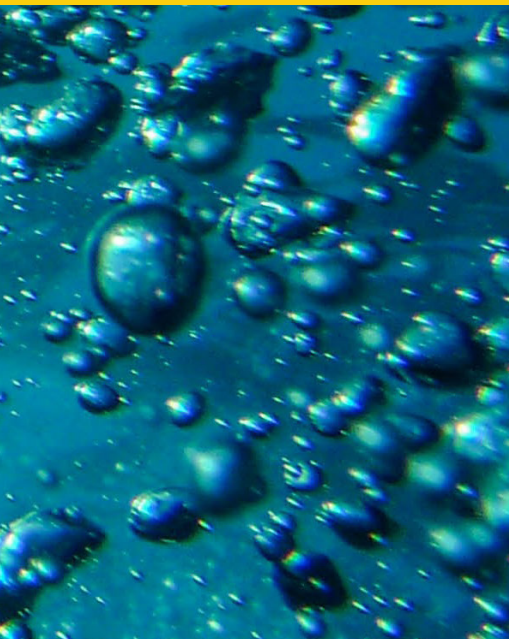
There is no detectable lead in drinking water leaving Durham's two water treatment plants.

We replaced our lead service lines years ago and add a corrosion inhibitor to the drinking water. We also diligently monitor water quality to ensure appropriate levels of corrosion inhibitor are maintained.

We test for lead and copper every three years. The tests we conducted in 2016 once again showed lead and copper levels to be well under action levels.

Elevated levels of lead can cause serious health problems, especially for pregnant women and young children.

Lead enters drinking water primarily due to the corrosion of materials containing lead used in older household plumbing and service lines that are not managed carefully.



Anyone with concerns about lead in their own drinking water can have their water tested and can take steps to minimize exposure, such as flushing tap water for 30 seconds to two minutes before using it for drinking or cooking. Call Durham One Call at (919) 560-1200 to request a water sample testing kit.

Want more information on lead and drinking water?

- Call EPA's Safe Drinking Water Hotline, (800) 426-4791

- Visit EPA's website, epa.gov/safewater/lead
- Visit the City's website, durhamnc.gov/944

ASSESSING WATER SOURCE VULNERABILITY

The N.C. Department of Environmental Quality (DEQ) Public Water Supply Section, through its Source Water Assessment Program (SWAP), periodically assesses all drinking water sources in the state – wells and surface water intakes – to determine their susceptibility to potential contaminant sources (PCS).

PCSs include animal operations, septage disposal sites, old landfill sites, underground storage tanks, and activities that could negatively impact

water sources in Durham, Person, and Orange counties – the watersheds of Lake Michie and Little River Reservoir.

The susceptibility rating is determined by combining a “Contaminant Rating,” which is based on the number and locations of PCSs within the testing area, and “Inherent Vulnerability Rating,” based on geologic, surface water, and watershed features and conditions.

A susceptibility rating of “higher” indicates the system’s potential to become contaminated by PCSs in the tested area, not the quality of the water. These findings help water managers identify areas and activities that may require monitoring or action.

The latest assessment results are summarized below.

SOURCE WATER ASSESSMENT PROGRAM RESULTS SUMMARY FOR DURHAM JULY 23, 2014

Source Name	Inherent Vulnerability Rating	Contaminant Rating	Susceptibility Rating
Lake Michie	Lower	Higher	Moderate
Little River Reservoir	Lower	Higher	Moderate

View the full report at www.ncwater.org/pws/swap.

To obtain a printed copy:

- Mail your request to: Source Water Assessment Program – Report Request, 1634 Mail Service Center, Raleigh NC 27699-1634
- OR email your request to swap@ncdenr.gov.

Please include the system name (City of Durham), PWSID (03-32-010) and your name, mailing address, and phone number.

Questions?

Contact DEQ's Source Water Assessment staff at (919) 707-9098.

Watershed Protections at Work

Comprehensive watershed protection ordinances developed by the City and County in the mid-1980s have helped maintain the high quality of both Lake Michie and Little River Reservoir.

Our plans provide buffers around the lakes and limit development density. Additionally, recreation programs allowed on the lakes are limited to ensure that drinking water remains their primary use.

In addition, in 2010, the City implemented a water rate policy that dedicates a penny per tier for watershed protection. These funds allow us to purchase additional buffer acreage around the lakes, as parcels become available.

Durham has spent \$6.6 million over the past 18 years to purchase 2,607 acres for buffering around Lake Michie, and we're pursuing a \$2.48 million purchase of 325 additional acres to protect our important water resources.

IMPROVING WATER SYSTEM INFRASTRUCTURE

CITY OFFICIALS BROKE GROUND IN OCTOBER 2016 ON A \$100 MILLION PROJECT THAT WILL SIGNIFICANTLY EXPAND THE TREATMENT CAPACITY OF OUR TWO WATER TREATMENT PLANTS, MODERNIZE FACILITIES AND OPERATIONS, UPGRADE TECHNOLOGY TO ENSURE ONGOING COMPLIANCE WITH DRINKING WATER REGULATIONS, AND STAY AHEAD OF DURHAM'S EVER-GROWING DRINKING WATER NEEDS FOR DECADES TO COME.

The project targets the Williams Water Treatment Plant, completed in 1917, and the Brown Water Treatment Plant, completed in 1977. The two plants currently have a combined water treatment capacity of 52 million gallons per day.

The project will:

- Increase the Brown plant's capacity from 30 million to 42 million gallons per day.
- Add permanent residuals (waste) handling facilities at both plants.
- Rehabilitate and improve treatment processes at both plants.
- Add state-of-the-art System Control and Data Acquisition (SCADA) systems at both plants.
- Construct a new LEED-certified administration/training facility at Brown.
- Remodel the operations facility at Williams.

Additionally, in 2016, we launched and/or completed a variety of infrastructure projects. Among them, we:

- Completed the multi-year Downtown Loop Waterline Replacement Project.
- Began initial phases of East Main Street Waterline Replacement Project.
- Completed the final phase of a four-phase, multi-year project to replace water meters throughout the City with automated meter reading technology.

The City of Durham spends more than one-third of its water and sewer budget each year on capital improvements and related debt service.

Read more about our improvement projects at durhamnc.gov/971 or visit DurhamWaterProjects.org.



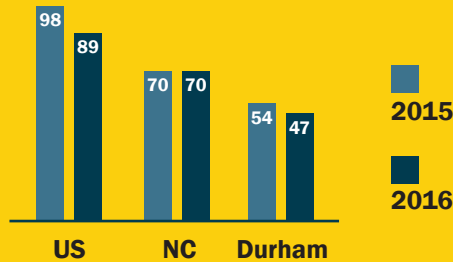
Above: Major expansions and upgrades are underway at the Brown Water Treatment Plant. Background Photo: Ceremonial shovels mark the start of work to significantly expand and upgrade the City's Brown and Williams water treatment plants.



CONSERVING OUR WATER RESOURCES

Residential Water Use

Average gallons per person per day



Durham residents consistently use far less water than the national average, and water use continues to drop.

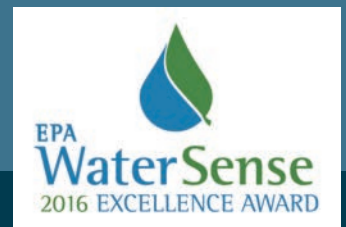
ENSURING THAT OUR WATER SUPPLIES LAST FOR FUTURE GENERATIONS IS A TOP PRIORITY, SO THE CITY HELPS RESIDENTS CUT BACK ON WATER USAGE WITHOUT SACRIFICING THEIR “WATER QUALITY OF LIFE.”

Durham was one of only 20 businesses, municipalities, utilities, and organizations nationwide recognized by EPA’s WaterSense program in 2016 for its commitment to protecting the environment through water efficiency. Our award-winning efforts are paying off.

Customer awareness, use of water efficient devices and fixtures, and programmatic incentives all play a part in inspiring water efficiency. Two key conservation initiatives are:

- **Toilet Rebate Program** – Toilets, on average, still account for nearly a quarter of the total water used in homes. Standard toilets use at least 1.6 gallons per flush. WaterSense®-labeled high-efficiency toilets (HETs) use at least 20 percent less than standard models and can save the average family nearly 13,000 gallons of water every year. The City offers residential customers up to a \$100 rebate for replacing water-wasting toilets with high-efficiency models.
- **Save Water Kit** – Pick up a Save Water Kit for only \$3 (from Cashiering at City Hall) and receive a water-efficient showerhead, aerators for your kitchen and bathroom sinks, and other useful items.

For information on all of our conservation programs, visit DurhamSavesWater.org.



CONSERVATION BY THE NUMBERS



3,659 individuals reached through 53 public education events, including school presentations and community and neighborhood events



725 toilet rebates issued for an estimated annual savings of nearly 4.5 million gallons of water per year



525 WaterSense® showerheads provided for an estimated annual savings of more than 2.6 million gallons of water per year



459 water efficient faucet aerators provided



316 water use assessments completed

PARTICIPATE IN CITY DECISIONS

Notice Under the Americans with Disabilities Act

Persons who require assistance should call (919) 560-4197, TTY (919) 560-1200, or email ADA@durhamnc.gov no later than 48 hours before the event.

Are you interested in how decisions about Durham's water system or other City issues are made?

The public is welcome to attend regularly scheduled meetings of Durham's City Council, where water management and other City issues are discussed. Council meetings are held the first and third Monday of each month at 7 p.m. in the Council chambers on the first floor of City Hall.

City Council members also hold regular work sessions to prepare for Council meetings. These sessions occur on Thursdays — two weeks prior to each regular Council meeting — at 1 p.m. in the Council's Committee Room on the second floor of City Hall.

City Hall is located in downtown Durham at 101 City Hall Plaza.

Visit the City's website at durhamnc.gov to confirm meeting times, locations, and agendas.

DURHAM



1869
CITY OF MEDICINE

Department of Water Management (DWM)

City of Durham
101 City Hall Plaza
Durham, NC 27701



QUESTIONS?

Water quality	(919) 560-4362
Water conservation and tours	(919) 560-4381
General DWM inquiries	(919) 560-4381
Billing (Durham One Call)	(919) 560-1200

Report a water main break or sewer overflow or backup

Durham One Call (919) 560-1200

durhamnc.gov/944

Versión en español disponible en línea en durhamnc.gov/946



/DurhamSavesWater



/DurhamWater